KORG

STRINGS SYNTHESIZER DL-50 Service Manual

CONTENTS

KEIO ELECTRONIC LABORATORY CORPORATION
TOKYO/JAPAN

1. SPECIFICATIONS

KEYBOARD	● C ~ C 49 keys

≪SYNTHESIZER SECTION≫

SIGNAL GENERATORS x 5	● 16', 8', 4', 2', White Noise
VOLTAGE CONTROLLED FILTER	● Cut-off Frequency, Resonance, EG Depth, Filter Mode (Bandpass/Lowpass), KBD Follower (On/Off)
ENVELOPE GENERATOR	● Attack Time, Decay Time, Sustain Level, Release Time, VCA EG Mode (/‾‾\\, ┌‾┐), Trigger Mode (Single/Multiple

≪STRINGS SECTION≫

OCTAVE	● OCT Balance (16' ~ 8')
ENVELOPE GENERATOR	● Attack, Release, Trigger Mode (Single/Multiple)
EQUALIZER	● Low, High

≪CONTROL SECTION≫

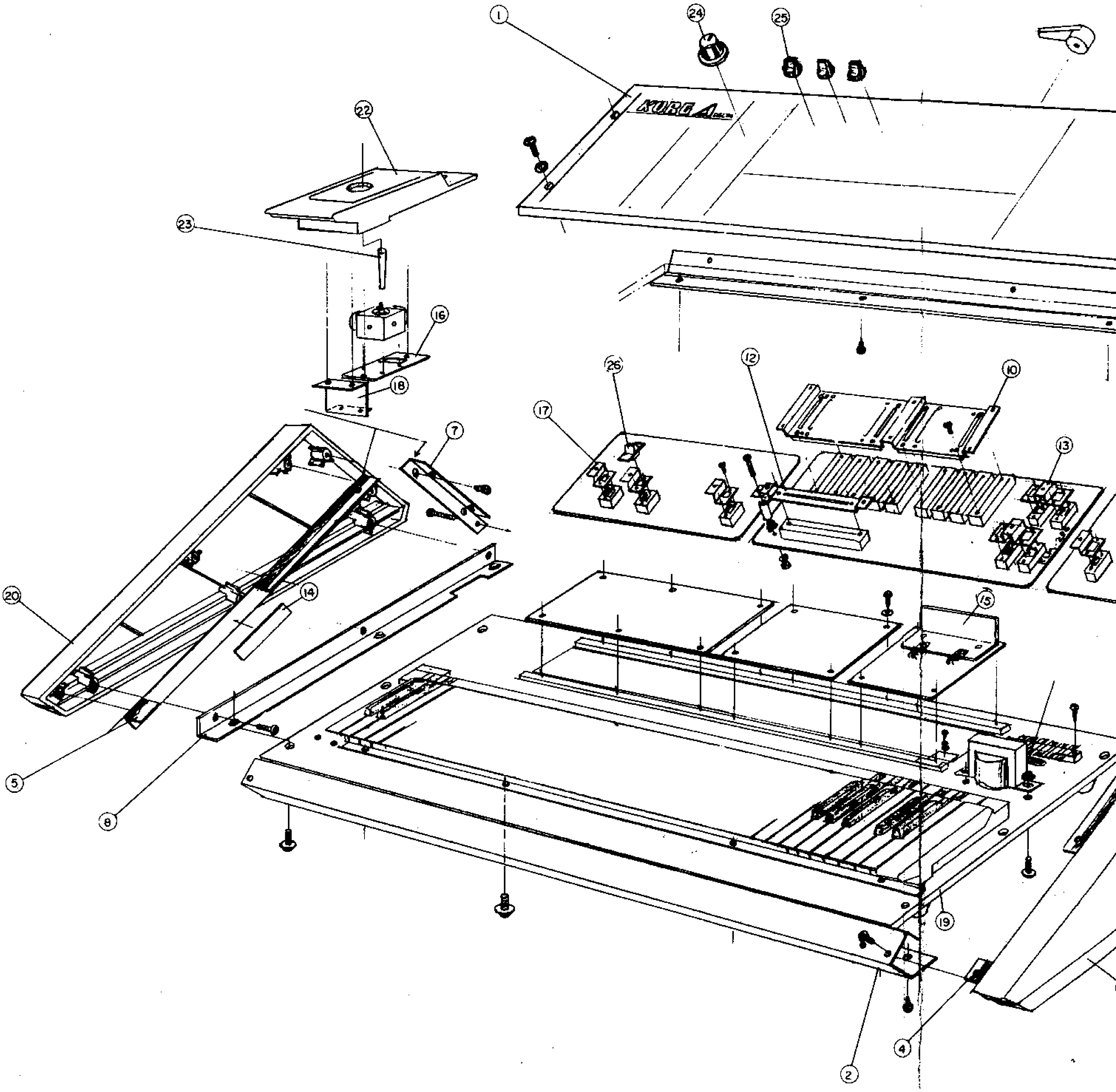
JOY STICK	● Pitch Bend, Vibrato Depth/Noise Modulation Depth
SIGNAL GENERATOR	● FM Depth, On/Off
VCF	● fcM Depth, On/Off
MODULATION GENERATOR	● Vibrato Depth, Speed
TUNE	● Tune (±100 cents), Octave (Up/Normal)
VOLUME	● Synthesizer, Strings, Power & Volume

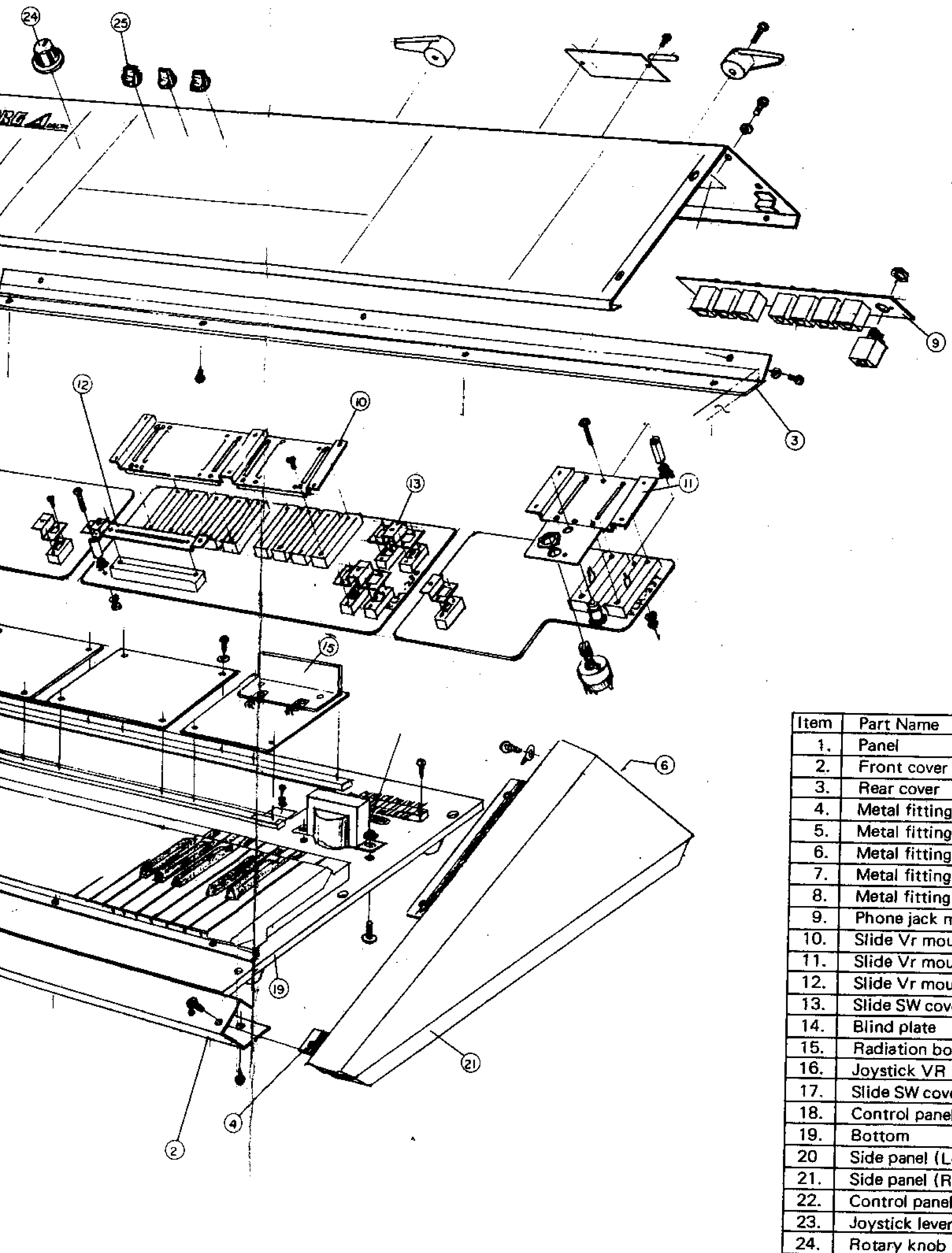
≪INPUTS & OUTPUTS≫

OUTPUTS	● Headphones Output, Mix Outputs x 2 (High/Low), Separate Outputs x 2 (Synthe/Strings), Trigger Output (‾┐_GND)
INPUTS	● VCF fcM in (–5V ~ +5V), Trigger in (‾┐_GND)

DIMENSIONS	● 836(W) x 153(H) x 378(D) mm
WEIGHT	● 10kg
ACCESSORIES	● Dust Cover, Connection Cord
POWER CONSUMPTION	● Voltage (Local Voltage, 50/60Hz), Wattage (15W)

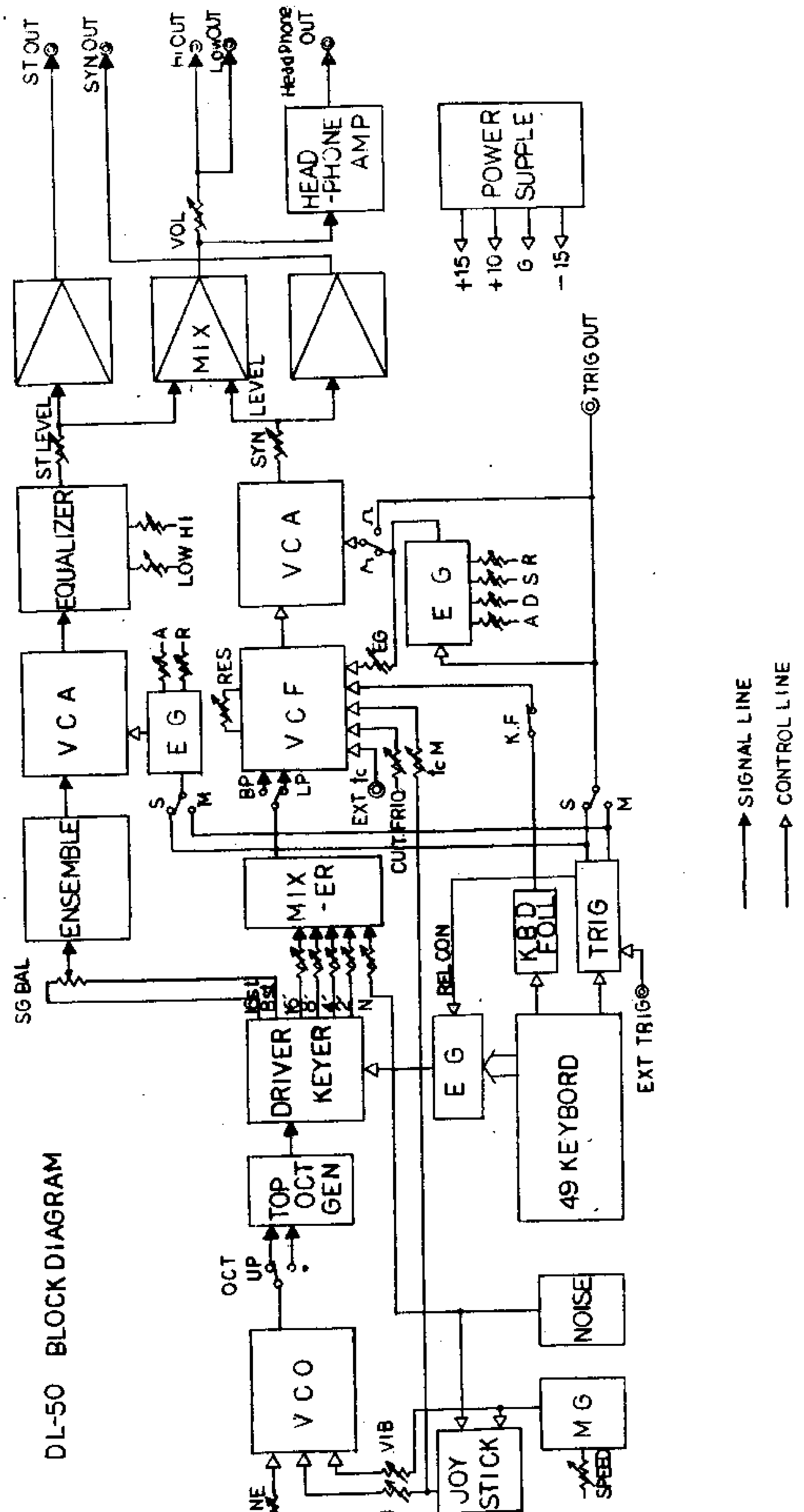
2. STRUCTURAL DIAGRAM





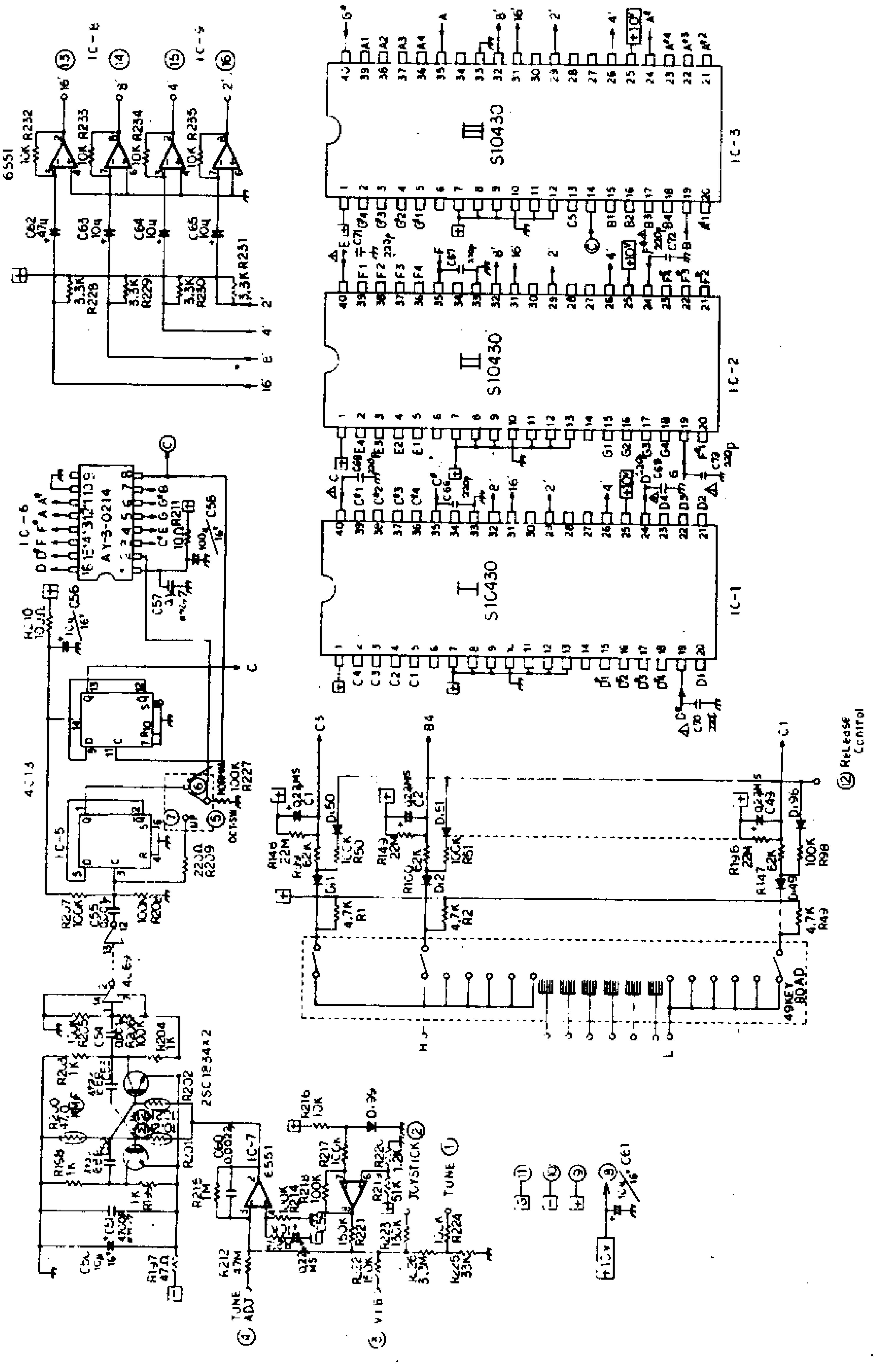
Item	Part Name	Remarks
1.	Panel	
2.	Front cover	
3.	Rear cover	
4.	Metal fitting of front panek: (A) Right	
5.	Metal fitting of front panel: (A) Left	
6.	Metal fitting of front panel: (B) Right	
7.	Metal fitting of front panel: (B) Left	
8.	Metal fitting of side panel	
9.	Phone jack mounting board	
10.	Slide Vr mounting board	
11.	Slide Vr mounting board	
12.	Slide Vr mounting board	
13.	Slide SW cover	
14.	Blind plate	
15.	Radiation board	
16.	Joystick VR mounting board	
17.	Slide SW cover	
18.	Control panel mounting board	
19.	Bottom	
20	Side panel (Left)	
21.	Side panel (Right)	
22.	Control panel	
23.	Joystick lever knob	
24.	Rotary knob	
25.	Slide VR knob	
26.	Slide SW knob	

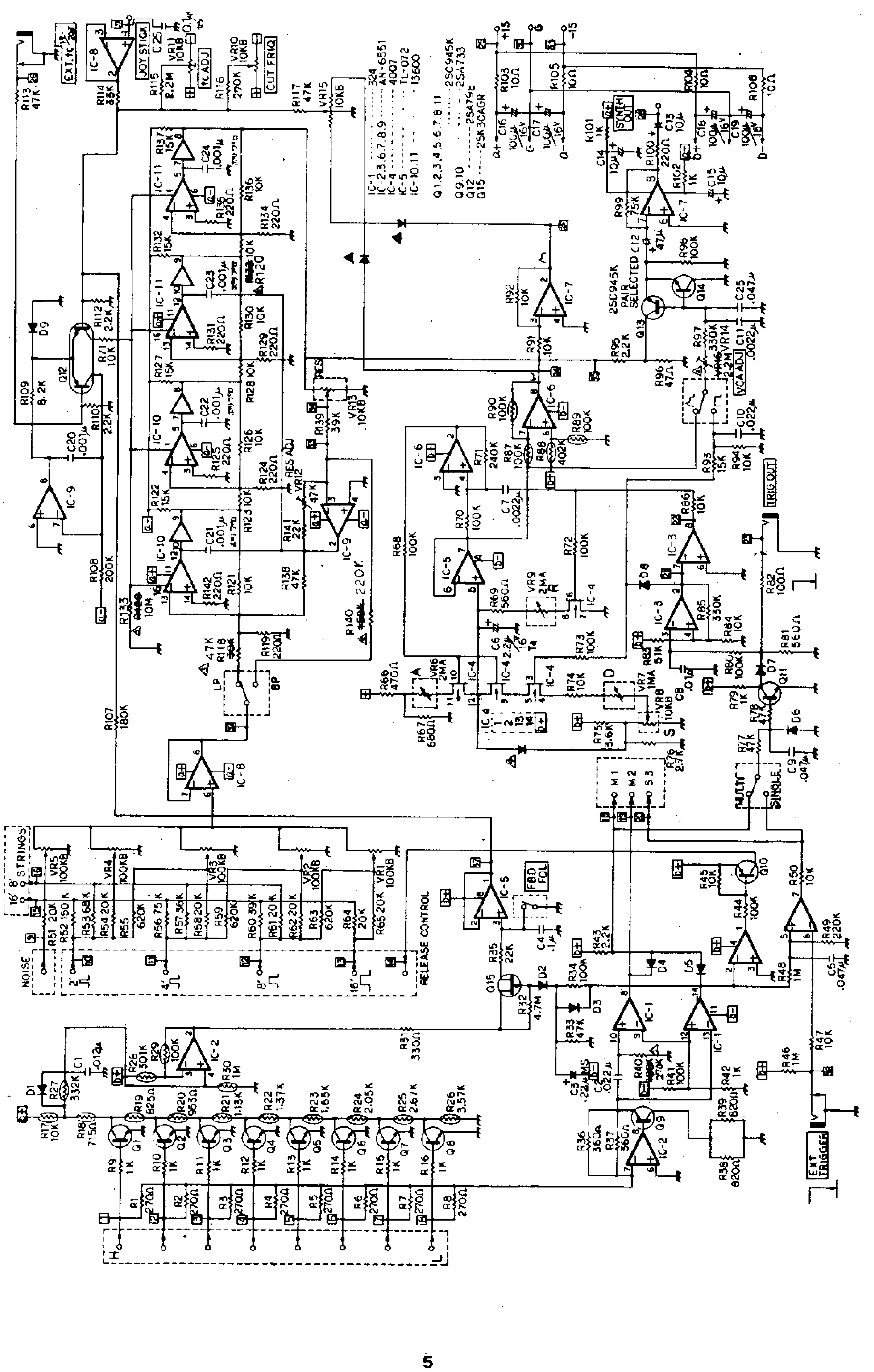
3. BLOCK DIAGRAM

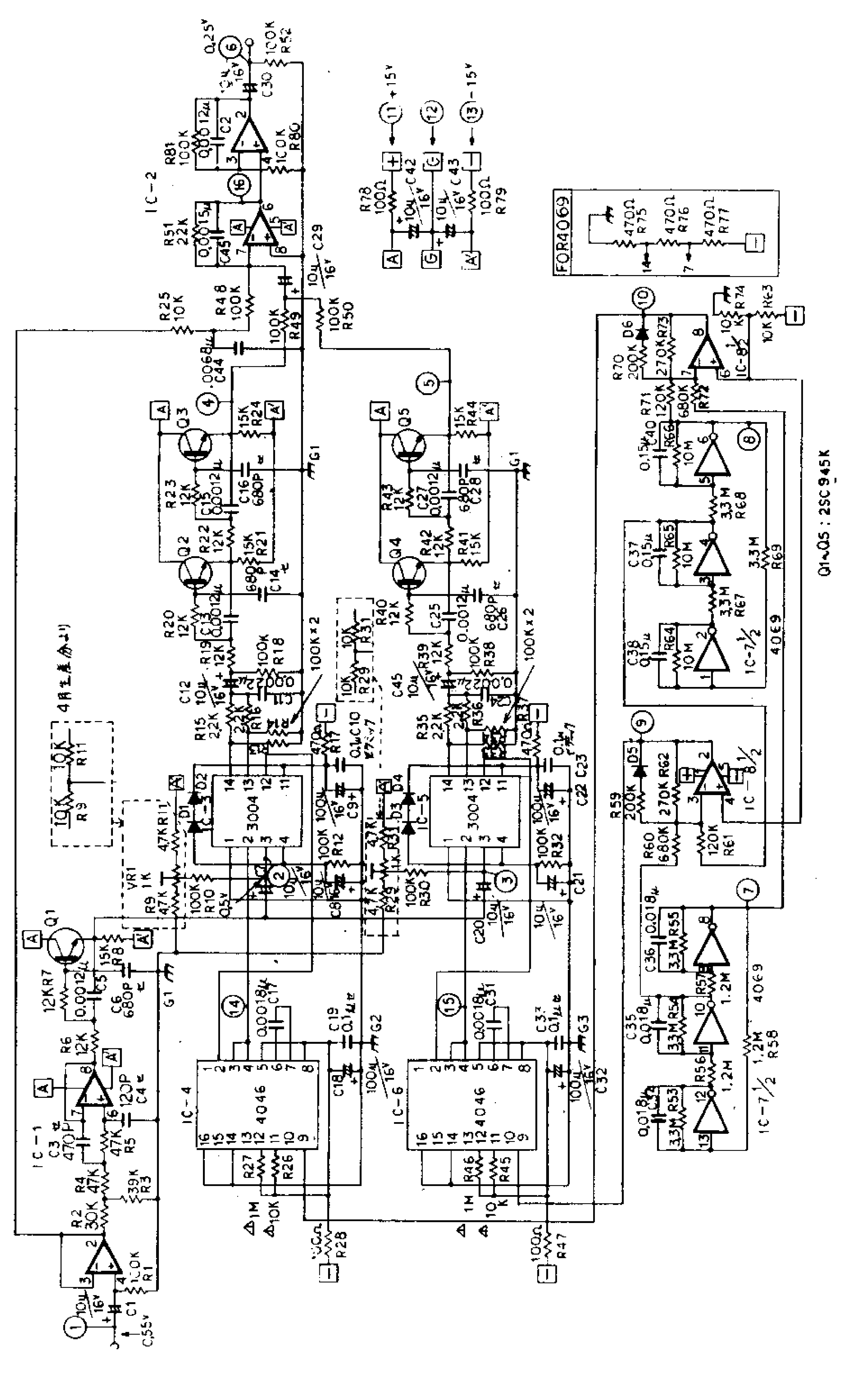


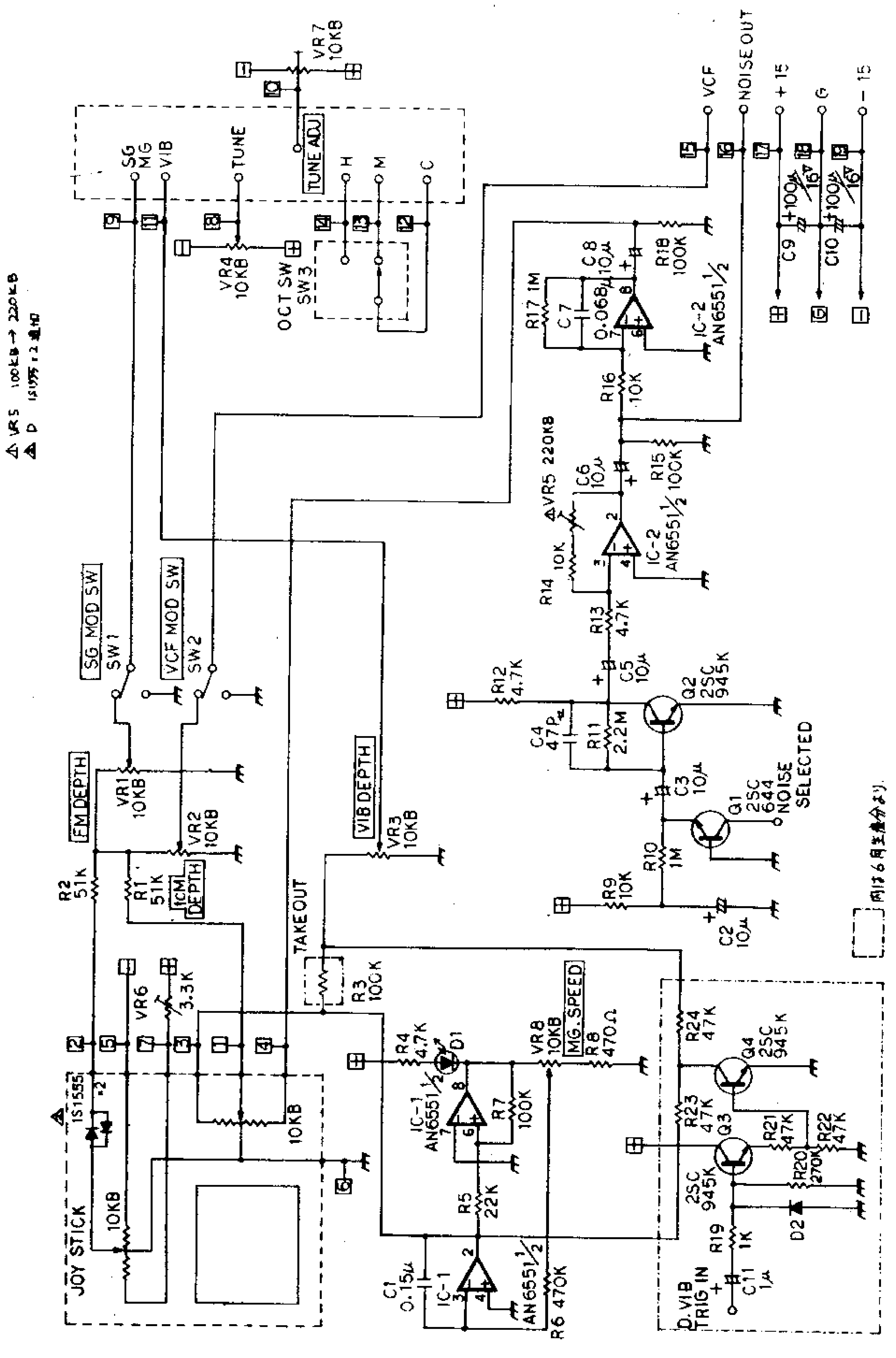
DL-50 BLOCK DIAGRAM

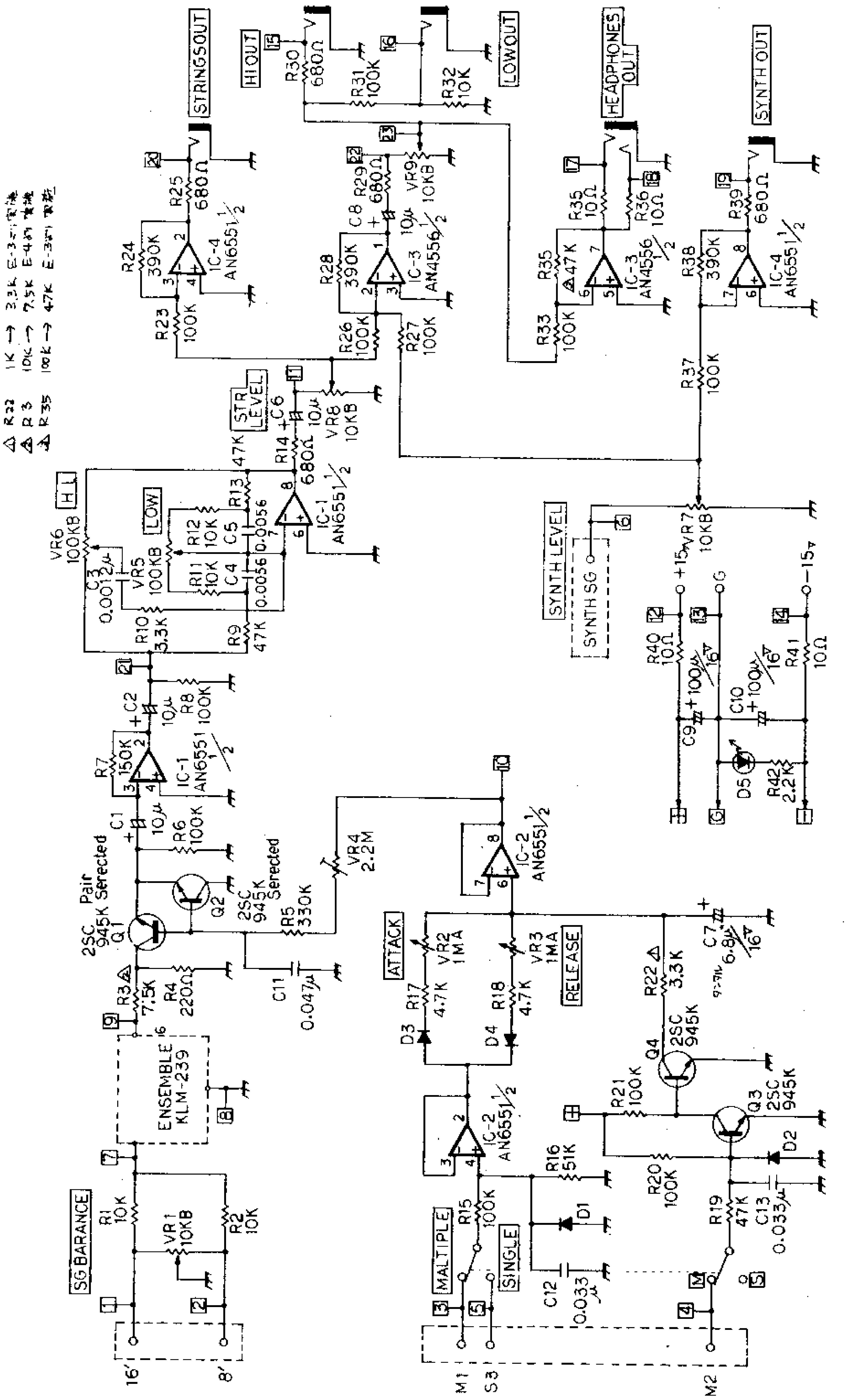
4. CIRCUIT DIAGRAM



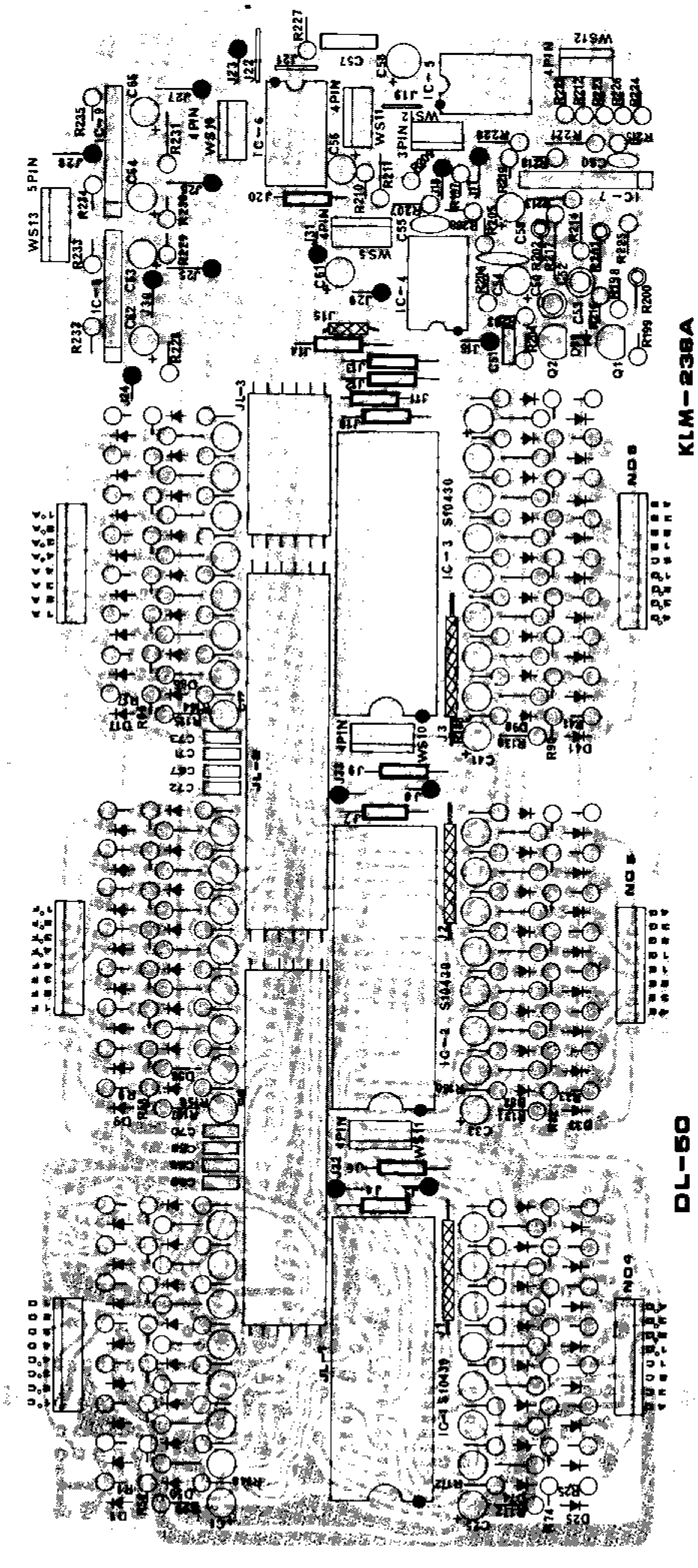



IC-1
IC-2
IC-4
IC-5
IC-6
4046
3004
4069
FOR4069
Q1~Q5 : 2SC945K


JOY STICK
10KB
1S1555
VR6
3.3K
FM DEPTH
VR1 10KB
VR2 10KB
R2 51K
R1 51K
FCM DEPTH
SG MOD SW
SW1
VCF MOD SW
SW2
VIB DEPTH
VR3 10KB
TAKE OUT
R3 100K
R4 4.7K
D1
IC-1 AN6551 1/2
R7 100K
R5 22K
C1 0.15μ
R6 470K
VR8 10KB
MG. SPEED
R8 470Ω
D. VIB TRIG IN
C11 1μ
R19 1K
D2
Q3 2SC 945K
R20 270K
R21 47K
R22 47K
R23 47K
R24 47K
Q4 2SC 945K
C2 10μ
R9 10K
R10 1M
Q1 2SC 644
NOISE SELECTED
C3 10μ
R11 2.2M
C4 47P
R12 4.7K
C5 10μ
Q2 2SC 945K
R13 4.7K
R14 10K
VR5 220KB
IC-2 AN6551 1/2
C6 10μ
R15 100K
R16 10K
R17 1M
C7 0.068
C8 10μ
R18 100K
C9 100μ 16V
C10 100μ 16V
VR4 10KB
OCT SW
SW3
SG
MG
VIB
TUNE
TUNE ADJ
VR7 10KB
H
M
C
VCF
NOISE OUT
+15
G
−15
VR5 100KB → 220KB

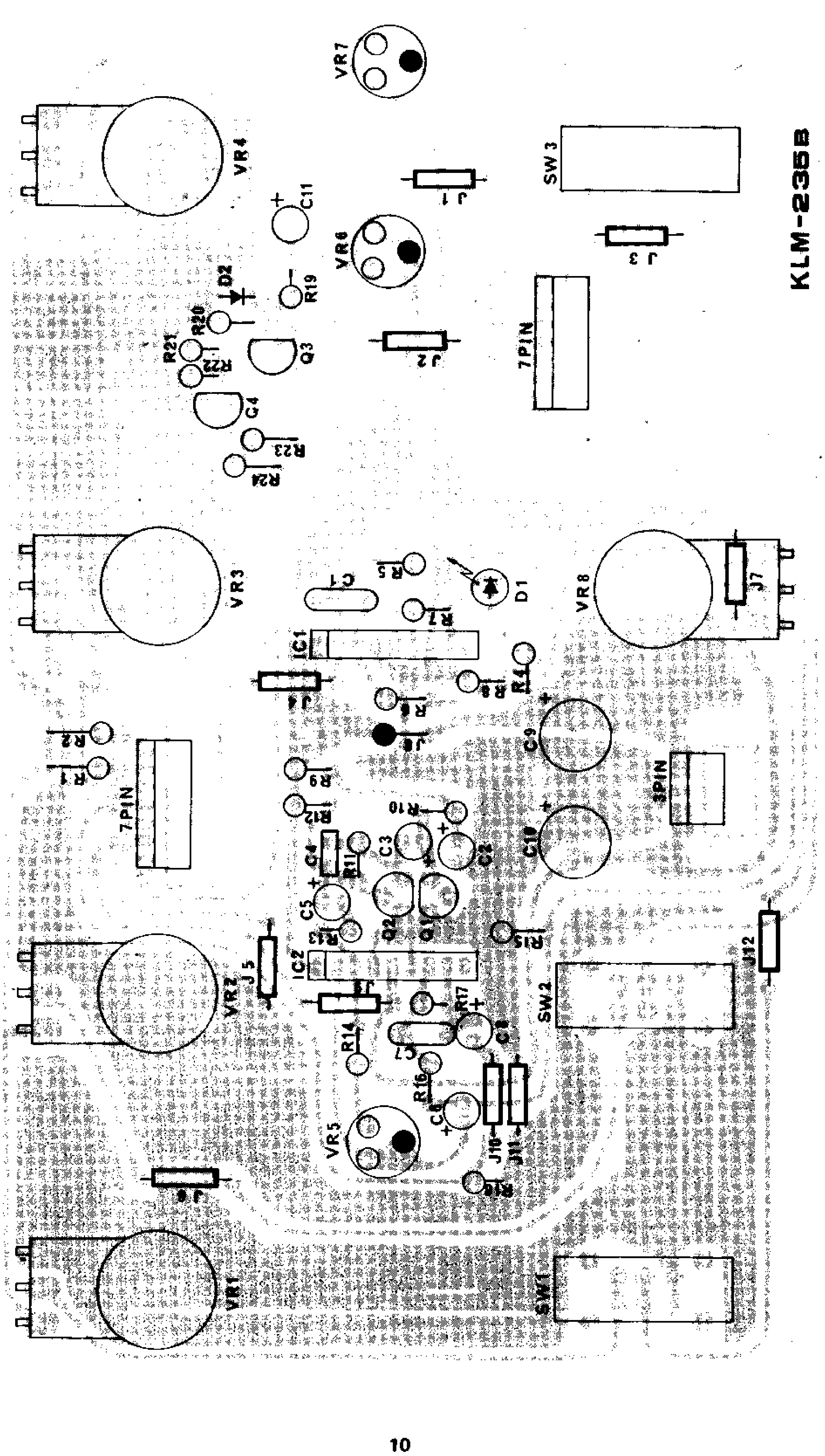

STRINGS OUT
HI OUT
LOW OUT
HEADPHONES OUT
SYNTH OUT
STR LEVEL
HI
LOW
SG BARANCE
ENSEMBLE KLM-239
SYNTH LEVEL
SYNTH SG
MALTIPLE
SINGLE
ATTACK
RELEASE

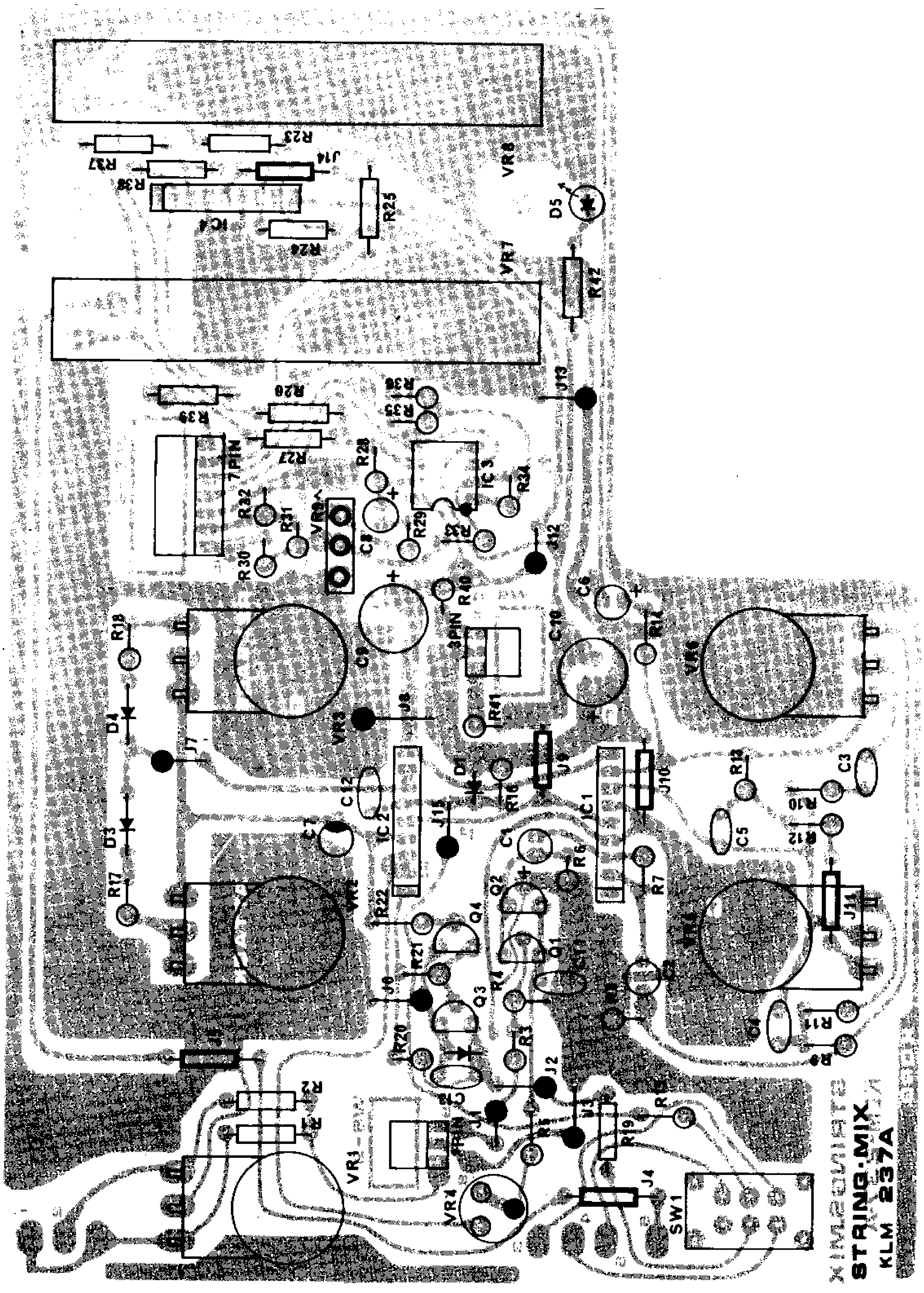
5. PC BOARD

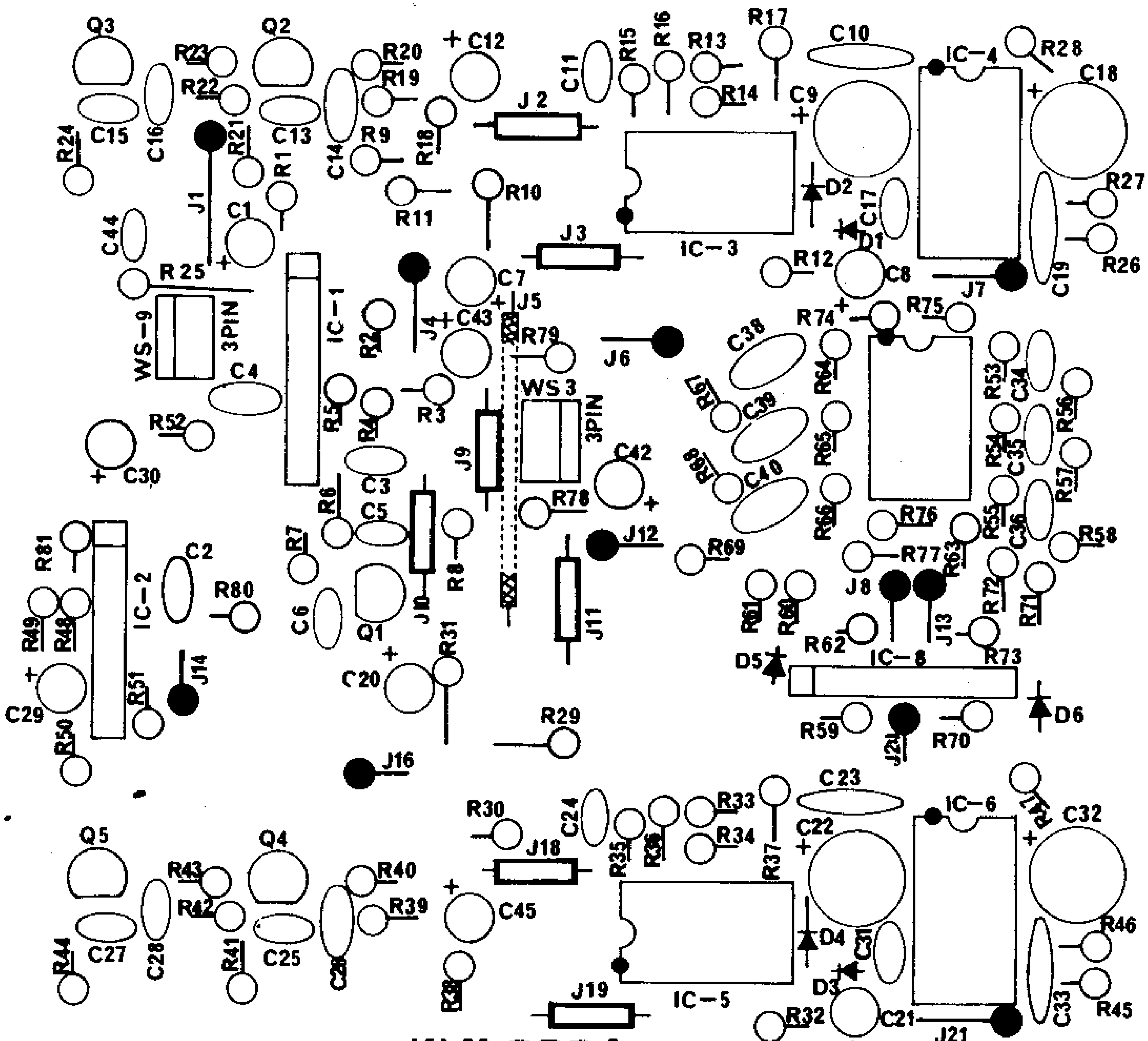


PARTS NAME	SPECIFICATIONS	Q'TY
KEYBOARD		
	C-C 49 ESK-316V	1
CONNECTORS		
	TRC-90	1
	BOTTOM ENTRY BE-3P-SHF-1	7
	BE-5P-SHF-1	1
	BE-7P-SHF-1	3
	BE-8P-SHF-1	1
	TOP ENTRY B-3P-SHF-1	3
	B-4P-SHF-1	6
	B-5P-SHF-1	1
	B-8P-SHF-1	5
	B-9P-SHF-1	1
PHONE JACKS		
	SG-7501	5
	SG-7617 with stopper	2
	SG-7701	1
LUG BOARD		
	L-1205	1
FUSE		
	250V 0.5V	1
CONNECTORS		
	WS-14	1
	WS-1 3P	1
	WS-2	1
	WS-3	1
	WS-4	1
	WS-5 4P	1
	WS-6 3P	1
	WS-7 7P	1
	WS-8	1
	WS-9 3P–3P	1
	WS-10 4P–4P	1
	WS-11	1
	WS-12	1
	WS-13 5P–5P	
PRINTED CIRCUIT BOARD		
	KLM 183B	1
	235A	1
	236A	1
	237A	1
	238	1
	239A	1
POWER TRANS FORMER		
	KA-221 100V, 220V, 240V	1
	KB-221 117V	1

PARTS NAME	PANEL INSTRUCTION	STANDARD
POTENTIOMETERS		
	VOLUME	EVC-BQ5-P18B14
	EG. DEPTH	EVH-6LA802B14
	STRINGS Attack	EVH-5LA802A16
	STRINGS Release	EVH-5LA802A16
	STRINGS Tune. T	EVH-5LA802B15
	STRINGS Tune. B	EVH-5LA802B15
	STRINGS Oct. Bal.	EVH-5LA802B14
	RESONANCE	EVH-5LA802B14
	TUNE	EVH-5LA802B14
	VIB. DEPTH	EVH-5LA802B14
	VIB. SPEED	EVH-5LA802B14
	fcM DEPTH	EVH-5LA802B14
	FM DEPTH	EVH-5LA802B14
	JOYSTICK	E3SXC03-10KB2
SLIDE VOLUME		
	STRINGS	LEE-3R 10KB
	SYNTHESIZER	LEE-3R 10KB
	EG. Attack	LEE-3R 2MA
	EG. Decay	LEE-3R 1MA
	EG. Sustain	LEE-3R 10KB
	EG. Release	LEE-3R 2MA
	S.G. 16'	LEE-3R 100KB
	8'	LEE-3R 100KB
	4'	LEE-3R 100KB
	2'	LEE-3R 100KB
	White Noise	LEE-3R 100KB
	V.C.F. Cut off Freq.	LDE-3R 10KB
SLIDE SW. KNOB		
	TRIGGER MODE	SSB-12208
	KBD FOLLOWER	SSB-12208
	FILTER MODE	SSB-12208
	(S) TRIGGER MODE	SSB-12208
	VCA EG MODE	SSB-12208
	OCTAVE	SSB-12208
	JOYSTICK SG	SSB-12208
	JOYSTICK VCF	SSB-12208
ROTARY KNOB		
	ROTARY KNOB x 13	
SLIDE Vr. KNOB		
	SLIDE Vr. KNOB x 12	KOC-E40039
SLIDE SW. KNOB		
	SLIDE SW. KNOB x 8	KOC-E40026
JOYSTICK UNIT		
	JOYSTICK KNOB x 1	
PHONE JACK		
	PHONES OUT	SG-7701
	VCF fcM IN	SG-7617
	TRIG IN	SG-7617
	OTHERS x 5	SG-7501


KLM-235B
VR1
VR2
VR3
VR4
VR5
VR6
VR7
VR8
SW1
SW2
SW3
IC1
IC2
7PIN
7PIN
3PIN
D1
D2
Q1
Q2
Q3
C1
C2
C3
C4
C5
C6
C7
C9
C10
C11
J1
J2
J3
J5
J7
J10
J11
J12


STRING·MIX
KLM 237A



Q3
Q2
R23
R22
R21
R20
R19
R18
C12
C11
R15
R16
R13
R14
R17
C10
IC-4
R28
C18
C9
C15
C16
C13
C14
R24
R9
J 2
D2
R27
J1
R1
C1
R11
R10
C17
C44
J3
D1
R26
R25
IC-3
R12
C8
J7
C19
IC-1
C7
J5
WS-9
3PIN
R2
J4
C43
R79
J6
C38
R74
R75
C4
R5
R4
R3
WS 3
3PIN
R67
C39
R64
R53
C34
R56
R52
C42
R65
R54
C35
C30
C3
J9
R68
C40
R57
R6
C5
R78
R66
R76
R55
C36
R58
R81
C2
R7
J12
R69
R77
R63
IC-2
R80
R8
J8
R72
R71
R49
R48
C6
Q1
J10
J11
R61
R60
J13
R31
R62
R73
D5
IC-8
J14
C20
R51
C29
R29
R59
J20
R70
D6
R50
J16
C23
R30
C24
R33
C22
IC-6
R47
C32
Q5
Q4
R35
R36
R34
R37
R43
R40
J18
C45
R42
R39
D4
C31
R46
C27
C28
C25
C26
R44
R41
R38
D3
R45
J19
IC-5
C33
R32
C21
J21

KLM-239A

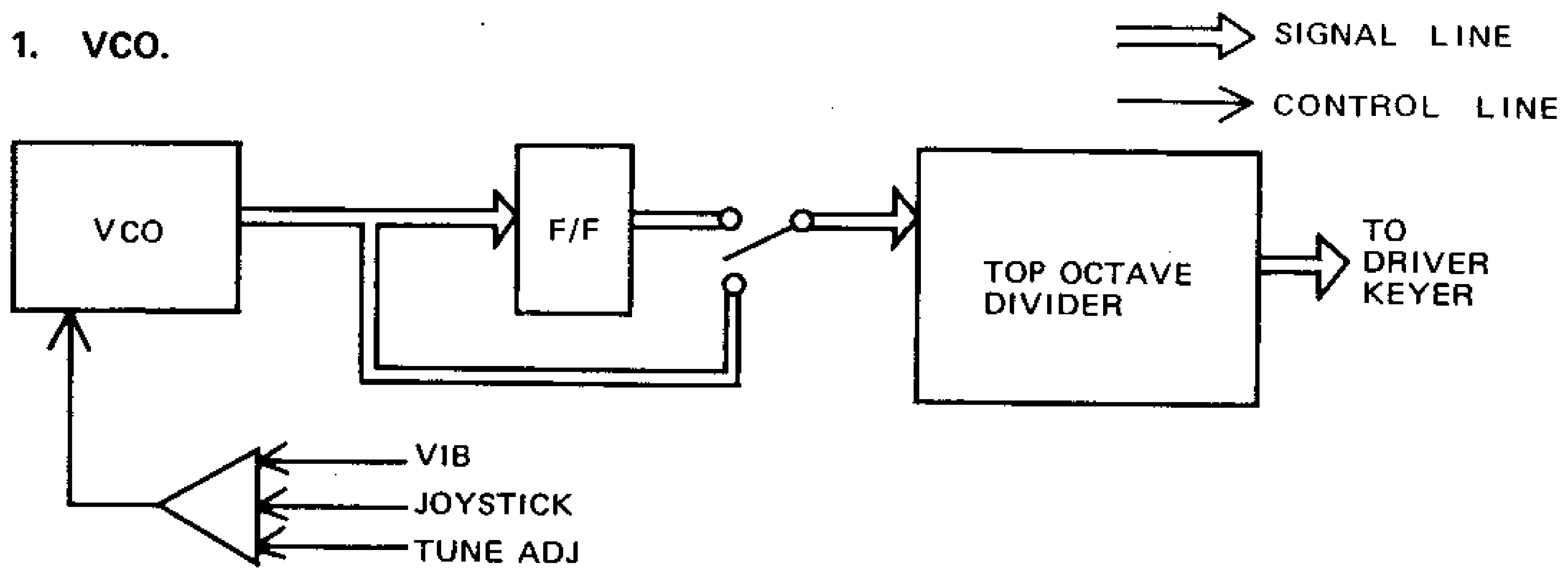
6. CHECK AND ADJUSTMENT

To service personnel:

As you may note in the block diagram, the DL-50 strings synthesizer does not oeprate on the Hz/V system.

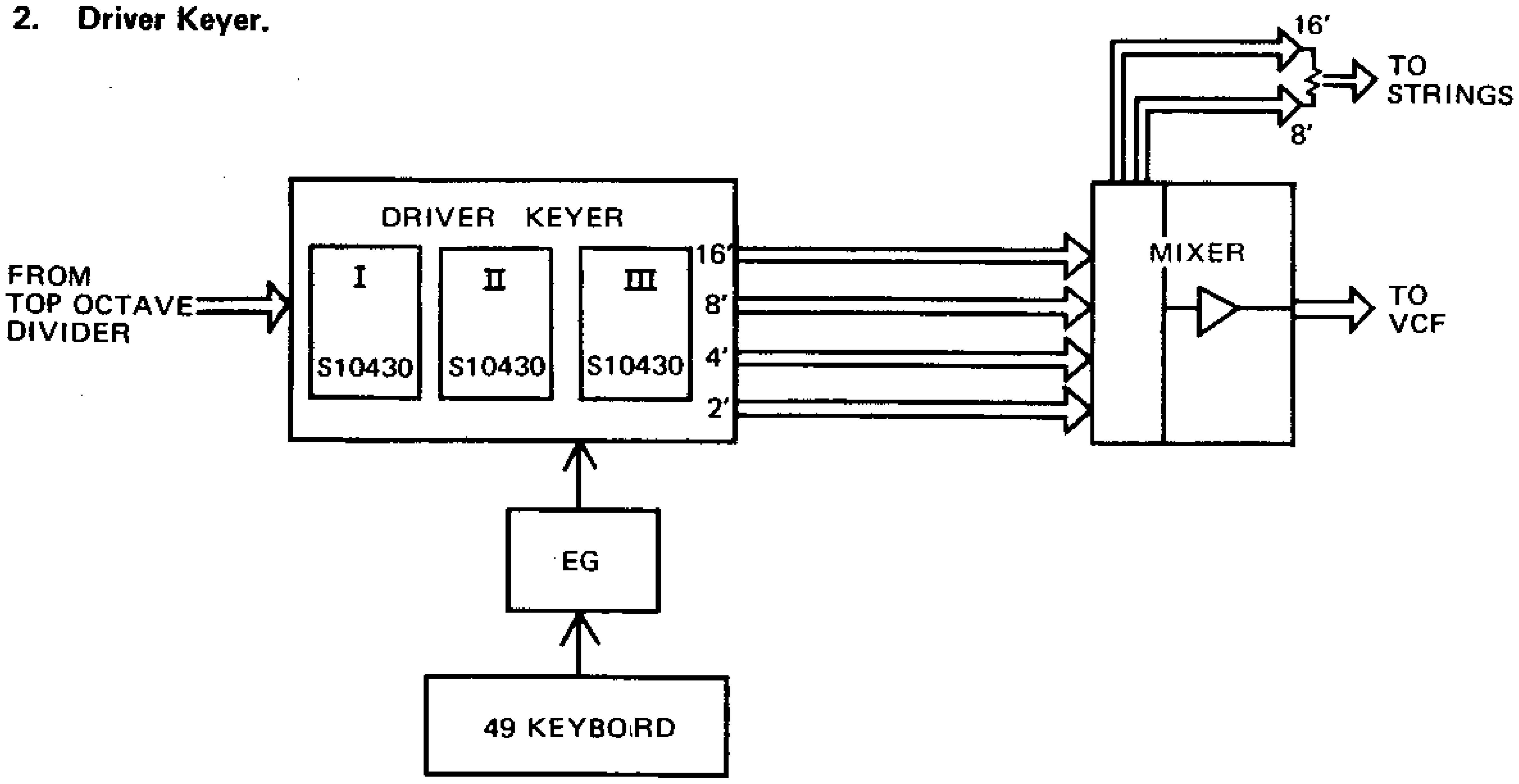
MAJOR CIRCUIT EXPLANATIONS

1. VCO.



The VCO is not controlled in the same way as conventional Hz/V systems. Instead, oscillation is continuous and the oscillator frequency changes depending on separate control voltages from the MG (vibrato), joy stick, and tuning sections. The VCO's clock pulse output frequency is divided by the flip-flop and drives the top octave divider (IC-AY-3-0214).

2. Driver Keyer.



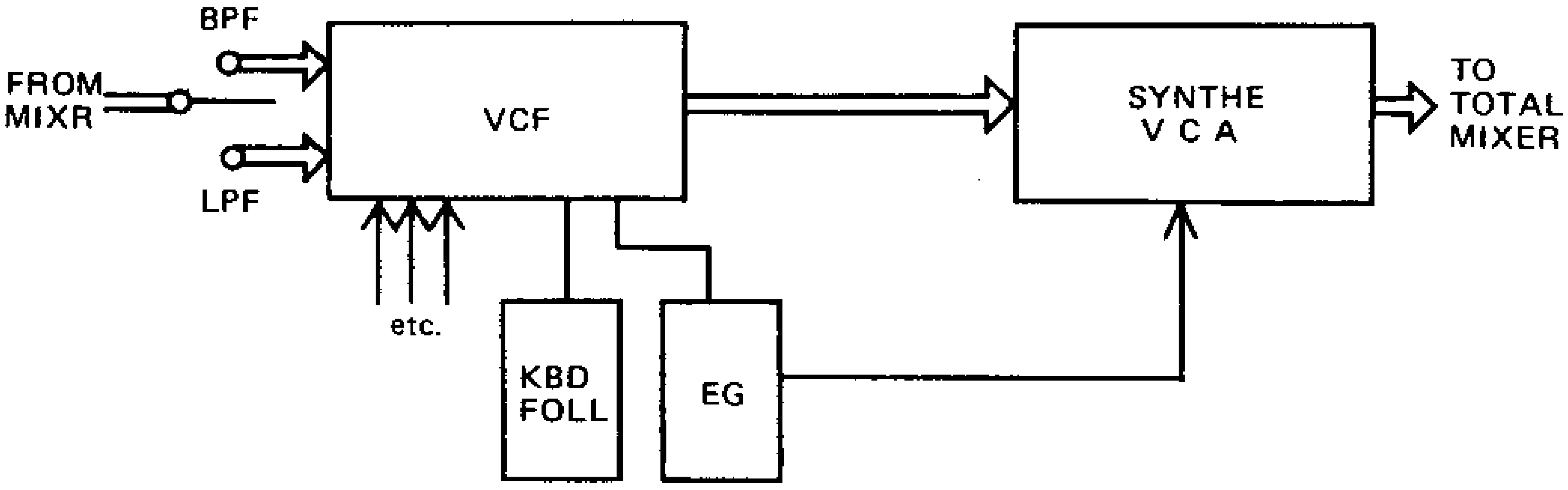
(The S10430 IC includes MOS gate, divider, and mixer circuit functions.)

The chromatic signal from the top octave divider output is applied to the IC-S-10430 input of the driver keyer. Each IC-S-10430 driver keyer IC provides a mixed output consisting of 4 notes in each octave. Three of these ICs, therefore, generate 48 notes. High C alone is obtained separately from the flip-flop and applied directly to the driver keyer input.

In other words: 4 notes x 4 octaves x 3 + 1 = 49 notes.

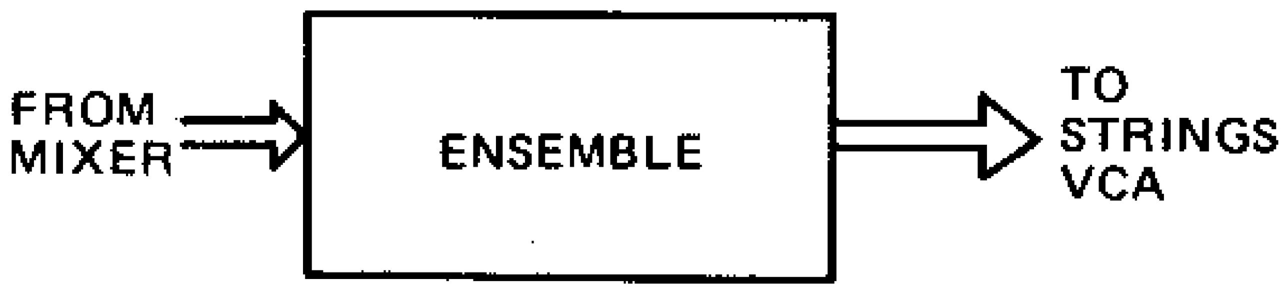
When a key is pressed on the keyboard, an envelope signal is applied to gate the note. The mixer output provides one signal for the strings section, and another signal for the synthesizer section.

3. VCF, VCA.

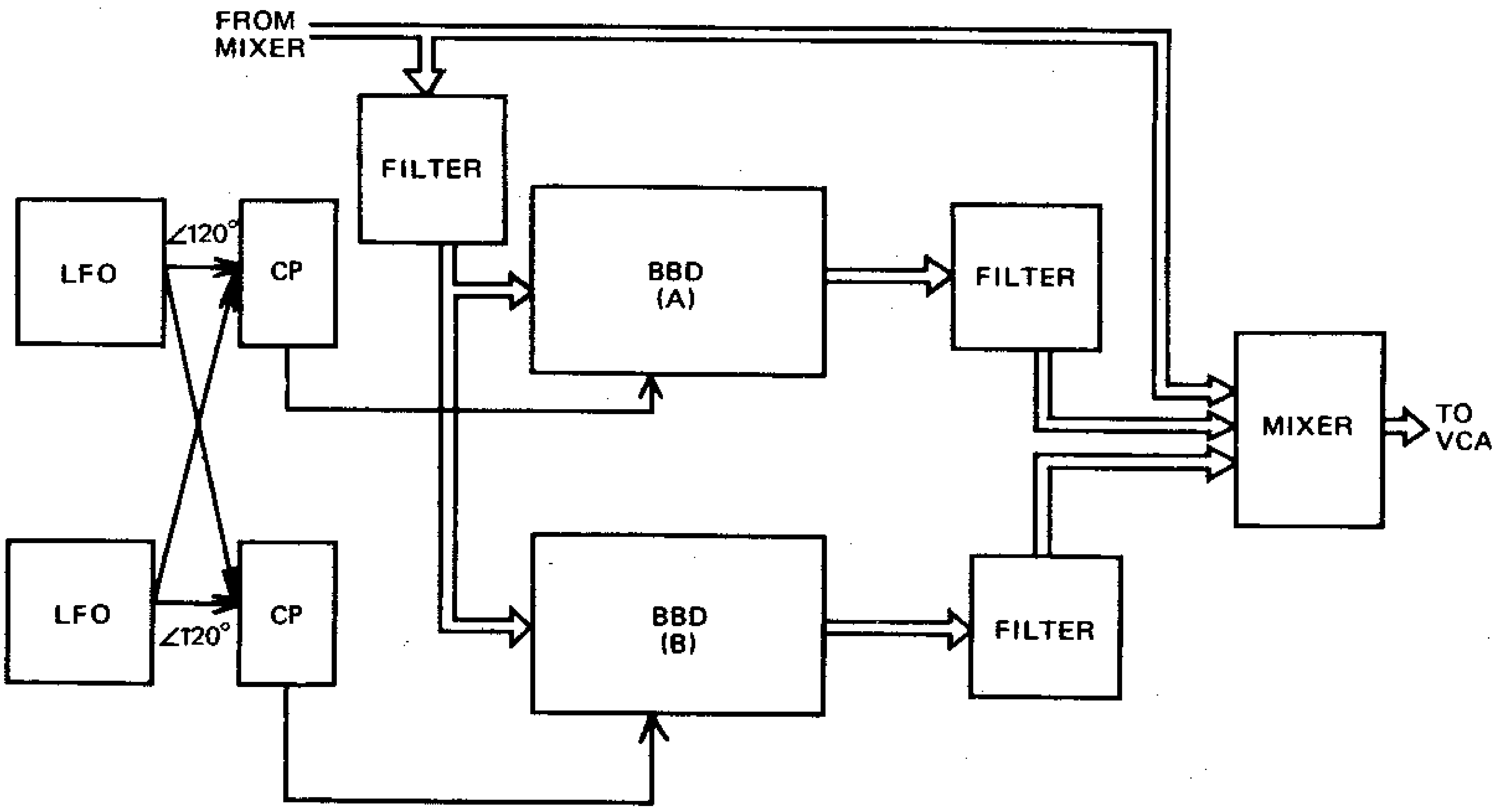


The mixer output signal is applied through LPF or BPF inputs to the IC-13600 VCF circuit. Filter operation is determined by control signals from KBD FOLL (keyboard follower), joy stick, cut-off frequency EG, etc.
EG control signal voltage determines VCA operation and thereby controls the audio signal input to the total mixer.

4. Ensemble.



The mixer output signal for the strings section is applied to two BBD ICs (IC-MN3004) to obtain the ensemble effect.
Please refer to the block diagram.



ENSEMBLE BLOCK DIAGRAM

DL-50 Adjustment procedure

Please refer to the owner's manual for check points not covered by the adjustment procedure described here.

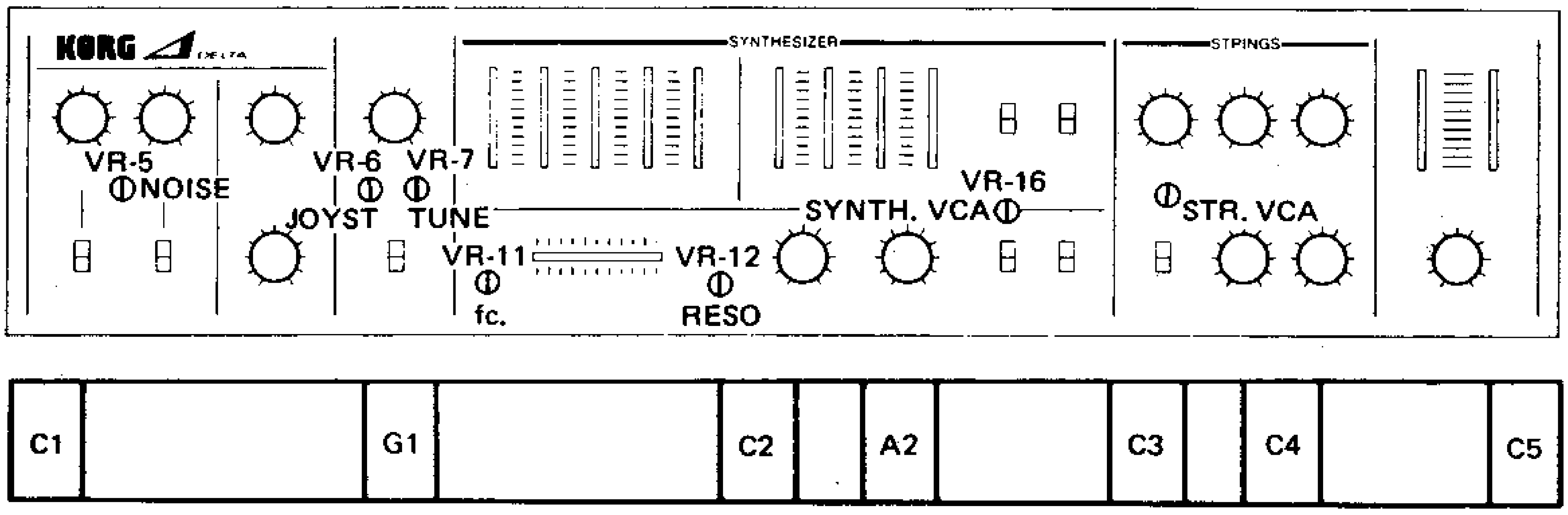
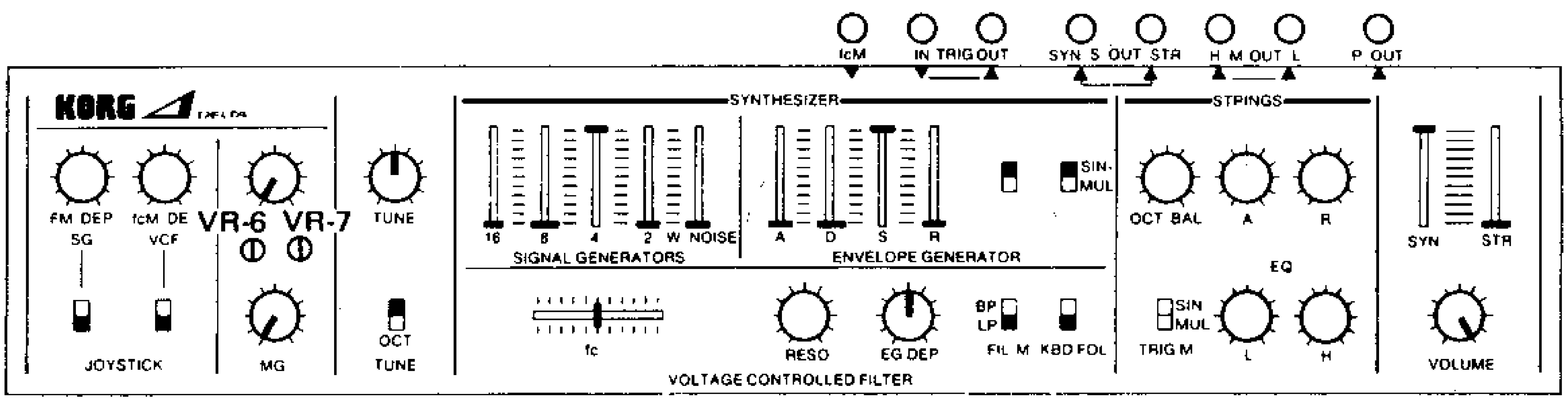
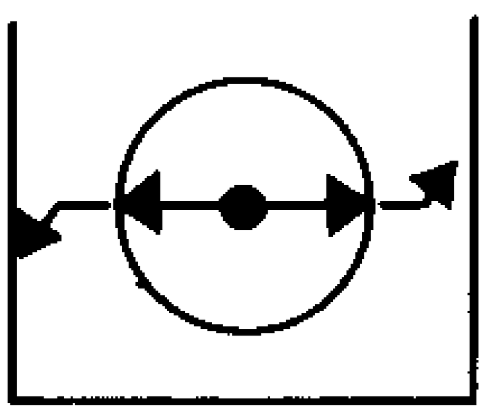


Illustration of trimmer screw and keyboard note positions.

1. Tune adjustment.

DL-50 MIX OUT (H) → WT-10A	WT-10A S/M → M
MIX OUT (L) → AMP	OCT → M





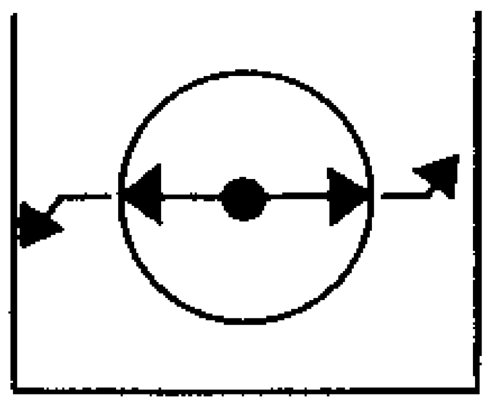
JOYSTICK

With controls at settings shown above, play key C3 and adjust VR7 to obtain a 0 cent reading on the WT-10A.
Next, set the release control to 2 and play C1 through C5 (in that order) while checking to see that the release time is about the same for each key.

2. Joy stick adjustment.

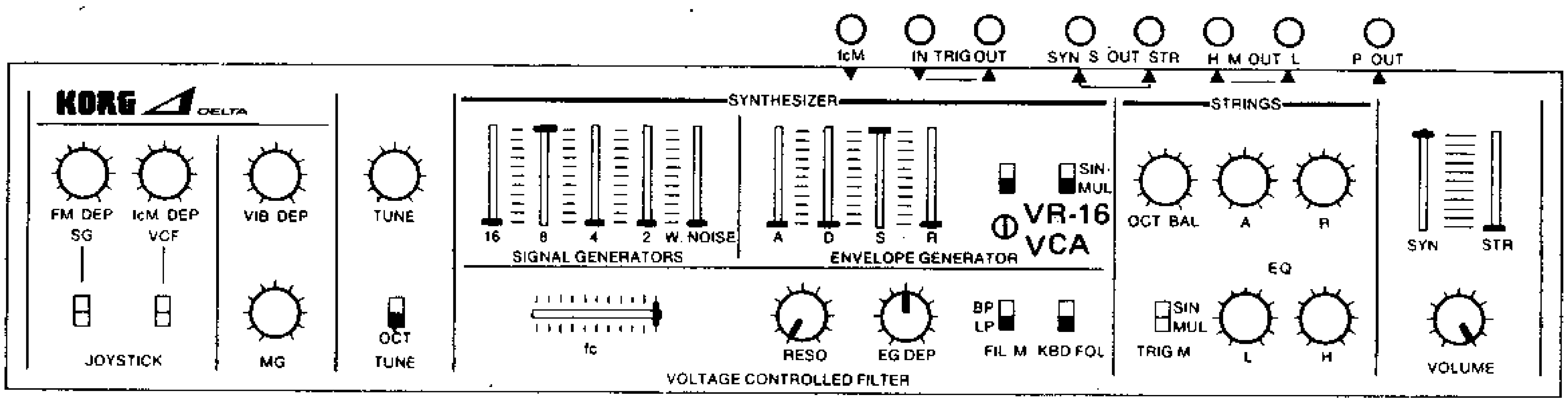
| Settings | fcM SW → OFF | FM SW → ON |

Settings
Play C1 and move the joy stick all the way to the right; adjust the FM depth control so the pitch rises to G1 during this procedure.
Next, play G1 and move the joy stick all the way to the left; adjust VR6 so the pitch falls to C1. (Repeat twice.)



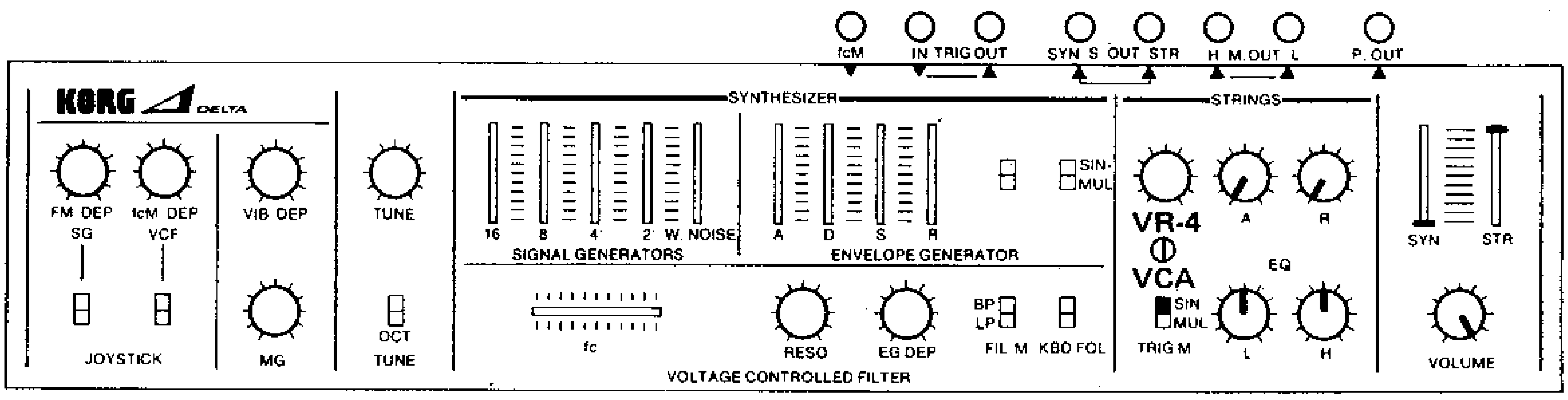
JOYSTICK

3. Synthesizer section VCA gain adjustment.

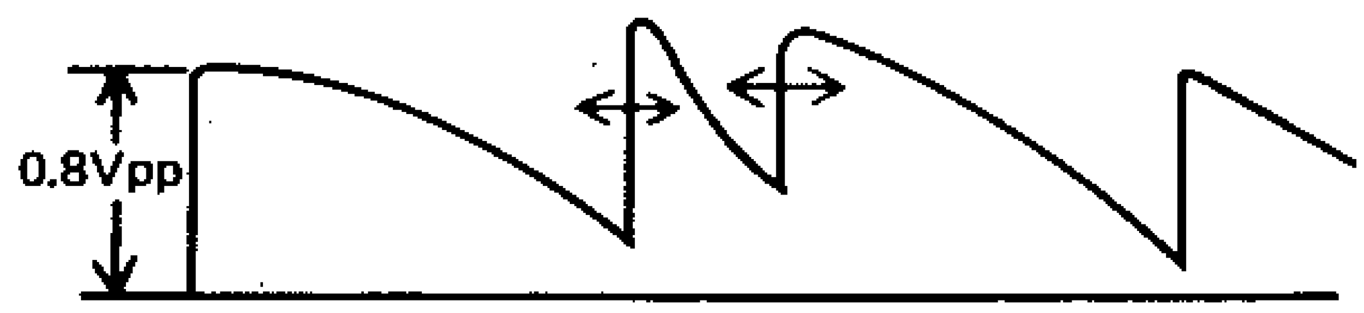


With the above setting, adjust VR-16 so that you obtain a 0.8Vpp reading when you play A2. Next, check to make sure there is no change in output voltage if you turn the EQ switch (VCA EG MODE) on and off.

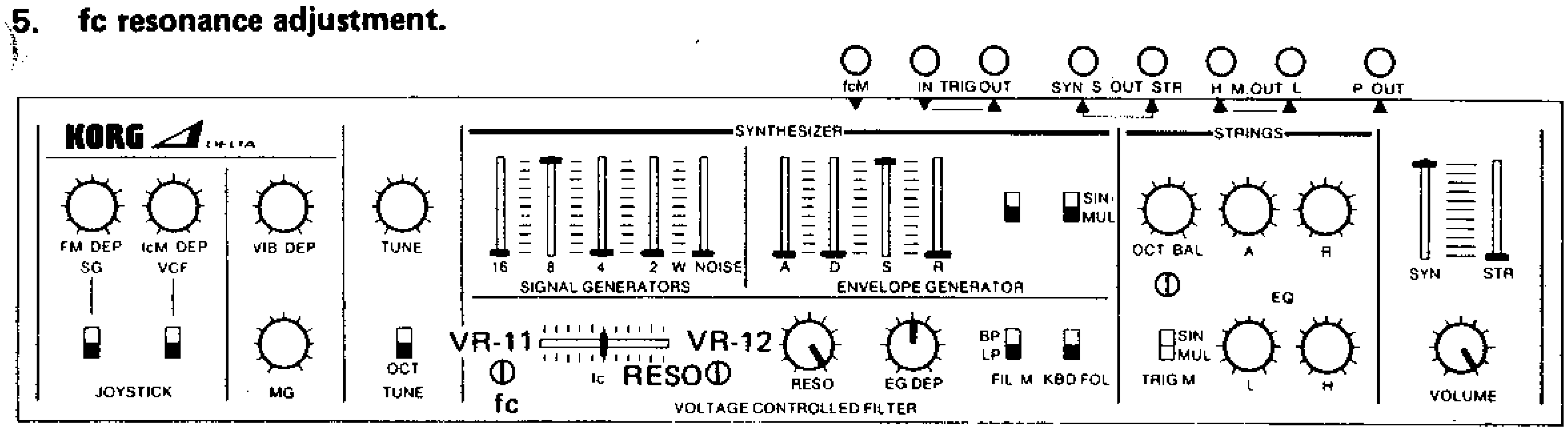
4. Strings section VCA gain adjustment.



With the above setting, play C1 and check three cycles of the signal waveform. Adjust VR4 to obtain 0.8Vpp for the leading edge of the first cycle; at the same time, check for movement in the following two cycles to confirm ensemble effect operation. Refer to illustration.



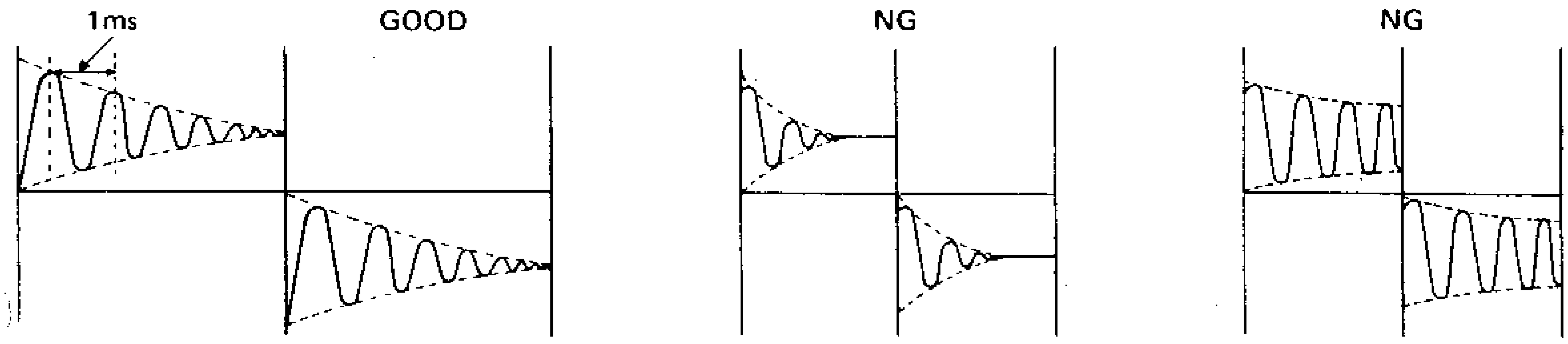
5. fc resonance adjustment.



fc: With the above setting, adjust VR-11 to obtain 1ms (1kHz) on the oscilloscope.

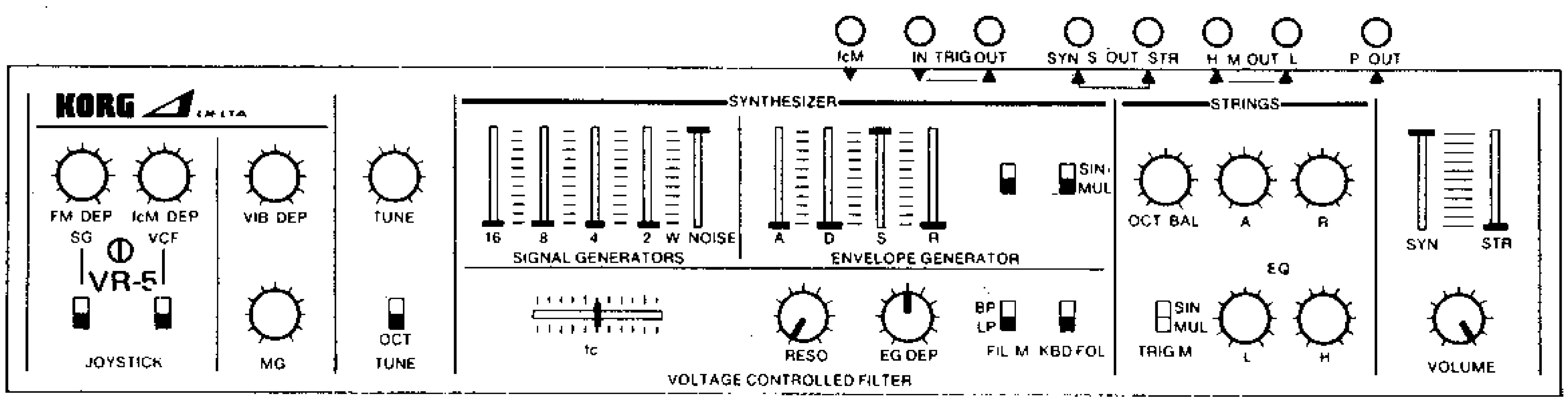
Resonance: Turn VR-12 counterclockwise to obtain an oscilloscope trace like the "good" example shown below.

Repeat the fc and resonance adjustments twice.



Check to confirm that the peak gets smaller and the fundamental waveform gets larger when you turn the resonance control counterclockwise.

6. Noise gain adjustment.



With the above setting, play a key and adjust VR-5 to obtain a 3Vpp noise output.

7. PARTS LIST

PARTS NAME	SPECIFICATIONS	Q'TY
METAL FILM RESISTORS		
	¼W 715Ω F	1
	825	1
	953	1
	1.13KΩ	1
	1.37	1
	1.65	1
	2.05	1
	2.67	1
	3.57	1
	10.0	1
	10.2	2
	47.0	1
	100	4
	301	1
	332	1
	402	1
	1MΩ	1
MYLAR CAPACITORS		
	0.001μF 50V K	3
	0.0012μ	7
	0.0015	1
	0.018	2
	0.0022	5
	0.0056	2
	0.0068	1
	0.01	1
	0.012	1
	0.018	3
	0.022	2
	0.033	2
	0.047	4
	0.068	1
	0.1	1
	0.15	4
POLYSTYRENE CAPACITORS		
	50V 68pF G	2
CERAMIC CAPACITORS		
	50V 47pF K	1
	120	1
	220	8
	470	1
	680	5
	4700 MD	1
	25V 0.1μF K ZFZ	8
TANTALUM CAPACITORS		
	16V 2.2μF K	1
	6.8	1
ELECTROLYTIC CAPACITORS		
	50V 1.0μF	1
	16V 10	32
	47	2
	100	13
	25V 1,000	1

PARTS NAME	SPECIFICATIONS	Q'TY
	25V 2,200μF	1
	50V 0.22	51
POLYPROPYLENE CAPACITORS		
	100V 0.001μF G	
TRANSISTORS		
	2SA 733AK	2
	798F or G	1
	2SC 644R	1
	945 L K	19
	945 L K (selected)	2
	1834	2
	2SK 30 GR	1
DIODES		
	1S 1555	126
	1885	4
	AR-2133D	2
IC		
	AN6551	17
	LM 324 N (μpc 324 c)	1
	TL 072	1
	LM 13600	2
	MC 14007	1
	NJM 4556D	1
	MC 14013 BCP	1
	AY-3-0214	1
	S-10430	3
	MN 3004	2
	MC 14046 BCP	2
	MC 14069 (μpD4069)	2
	(μA 7815) μpc 14315	1
	μA 7915 (MC 7915)	1
	(μA 78L08) μpc 78LD8AC3	1
SEMI-FIXED RESISTORS		
	SR-19R 3.3KB	1
	10KB	2
	47KB	1
	220KB	1
	2.2MB	2
ROTARY VARIABLE RESISTORS		
	EVH-5LA 802 B14	7
	EVH-5LA 802 B15	2
	EVH-5LA 802 A16	2
	EVH-6LA 802 B14	1
	EVC-BQ5P18B14	1
	E3-JXCO3 10KB x 2	1
SLIDE VARIABLE RESISTORS		
	LEE-3R L = 45mm 2MA	[illegible]
	10KB	3
	1MA	1
	100KB	5
	LDE L-60mm 10KB	1
SLIDE SW		
	SSB-12208	8